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TICOM/I - 148

GERMAN D/F AND INTERCEPTING SYSTEM AGAINST
ILLICIT TRANSMITTERS.

The attached report was written at OSLO on 8th August 1945 under the control of the British Military Authorities there, by

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Oslo, 8th August 1945.

Richard Novotny
Josef Hockauf
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Subject: German D/F and intercepting system against illicit transmitters.

General Remarks

There were two separate services dealing with D/F and intercepting in Germany and the occupied territories.

- 1) Intercepting and D/F units of the German army under the direct command of the German High Command in Berlin.
- 2) Technical units of the civil police (Ordnungspolizei) under the command of the C.S.O. of the civil police in Berlin-Spandau.

There was actually no great difference between the organisation and the system of both services. Cooperation however was very ineffective and existed practically only in a joint signal board under the command of a high ranking officer of the German High Command, where general questions of organisation were settled.

Organisation

Stationary intercepting units specialised for the different illicit networks intercepted practically all illicit and suspected wireless traffic. Intercepting units were connected to long range direction finders either by direct telephone and teleprinter or wireless links.

Whenever illicit traffic was intercepted all long range D/F were immediately informed and put into action while the traffic was on the air.

The use of a telephone installation with loudspeaker had the advantage that the signals of the illicit transmitters could be made audible through the loudspeakers in the operation rooms of the D/F stations, thus enabling the D/F operators to find the wanted transmitter easier.

The bearings were immediately reported from the D/F stations by teleprinter to the central plotting office in Berlin. There the bearings were plotted on maps and the resulting cross bearings indicating the approximate location of the illicit transmitter sent to the interception and D/F centres of the respective territories.

The accuracy of the bearings shifted between 30-50 km and was generally sufficient for the mobile D/F to enter the range of the ground wave. Generally 2-3 D/F cars were simultaneously put into action from different places in order to get a cross bearing as accurate as possible.

When the mobile D/F succeeded in getting a crossbearing with an accuracy of about 1-2 km, specialists with small range D/F mounted in suitcases or in body harness worn under the clothes had to locate the exact position of the transmitter.

The location of the intercepting and D/F units
of the two services

<u>Army</u>	<u>Civil Police</u>
HQ Berlin	Berlin-Spandau
Hannover	Oldenburg
Cranz (East Prussia)	Konstanz
Köge (Denmark)	Wien
Brussels	Prag
Brest	Tilsit
Reval	Warschau
Graz	Krakau
Paris	Oslo
Italy	Trondheim
Greece	Netherland

The army was responsible for the D/F in Northern France and Belgium, Denmark, part of Netherland, Italy, Greece, Balkan, part of Poland and Russia.

The civil police for the rest of France, Germany, Czechoslovakia, Netherland, Norway, part of Poland.

Organisation of D/F and intercepting system in Norway

Central office (Oslo, Besserud, Dr. Holmsvei 15)
with following sections:

- 1) Intercepting station
- 2) Plotting office
- 3) Long range direction finders
- 4) Teleprinter station
- 5) Wireless station
- 6) Mobile direction finders
- 7) D/F aeroplanes (Fieseler Storch)
- 8) D/F boats
- 9) Maintenance depot.

Details

- 1) There was a stationary intercepting unit at Oslo and in Trondheim. All illicit transmitters of the so-called Western net (located in Norway, Denmark, France, Belgium and Netherland) had to be intercepted. Besides special interceptors had to keep a search watch for the Russian illicit wireless system and all unknown and suspected traffic.
- 2) In the plotting office all messages about bearings concerning transmitters located in Norway were collected and plotted on maps. The results were passed to the mobile D/F for action in the suspected zones.
To each illicit wireless line was allotted a number from the joint signal board in Berlin.
Every night reports arrived by teleprinter from the HQ in Berlin about frequencies, call signs, schedules and characteristics of new channels, details about channels already known. In addition new types of transmitting plans seized in all parts of Europe were immediately forwarded to all intercepting units. For each channel a special card containing all details was provided which had always to be held up to date. The interceptors had at their disposal both

Card index and a list of call signs. Besides messages of wireless channels whose codes were seized were decoded, documents translated etc.

- 3) The civil police in Norway had no long range D/F for its own but had to rely upon the D/F stations of the Luftwaffe.

The following D/F stations were used for this purpose:

Fornebu (Oslo)
Jessheim (north of Oslo)
Naerland (south of Stavanger)
Ørlandet (near Drontheim)
Bergen
Bardufoss (Northern Norway)

There were direct telephone lines from the Norwegian HQ to Fornebu and Jessheim. The other D/F stations in Norway were warned by wireless from Fornebu.

It was often necessary to rely chiefly on the bearings of the long range D/F base in Norway as the angle between the different bearings from the D/F stations situated on the Continent would be too acute and the crossbearing therefore too inaccurate.

- 4) The teleprinter station had direct lines to the HQ in Berlin, to Trondheim, Bergen, Stavanger, Kristiansand and Tromsø.

- 5) The transmitter of the W/T station was situated at Tryvandshöiden but keyed from the HQ in Oslo.

There was a wireless link to Berlin, and a group to Bergen, Trondheim and Tromsø. Generally the W/T station was only used in emergency cases, when the teleprinters were not working. There was in addition a group from the HQ to the mobile D/F cars in the Oslo zone.

- 6) There were mobile D/F parties for the Oslo area (including Oslo Fjord), Kristiansand, Stavanger, Bergen, Trondheim and Tromsø.

- 7) The use of D/F aeroplanes (Fieseler Storch) in Norway was ineffective. One can quote the following reasons:

Owing to the atmospheric and geographical conditions the aeroplanes could only be used during the Summer. Even during this time the Fieseler Storch, (the only one, stationed at Fornebu) could not get a single crossbearing valuable for the mobile D/F. Besides all operators were warned to look out for this sort of aircraft.

- 8) D/F boats (former cutters) chartered from the navy were stationed in Oslo, Bergen, Trondheim and Tromsø. In addition motor-torpedoboats were provided by the navy when necessary, particularly when it was impossible to get an accurate bearing of a transmitter located in rocky mountains on the coast.

Illicit wireless systems known to the German intercepting units.

- 1) Western net,

comprising all illicit transmitters with home station in the U.K. and located in France, Belgium, Netherland, Norway and Denmark. The net was formerly called LCA net as the first illicit transmitter captured by the Germans used the call sign LCA.

- 2) WNA net,

comprising all illicit transmitters in Germany and the occupied territories whose home-stations were located in Russia.

- 3) MBM net,
all transmitters located in Czecho-Slovakia with the home station in England.
- 4) P.S. net,
all transmitters in Poland with the home station in England.
- 5) Balkan net
- 6) Algiers net (controlled by U.S.A.)
Wireless channels between the HQ station in Algiers and Italy.

Types of equipment used for interception and D/F

Intercepting receivers:

Körting
 Lorenz
 Lehmkuhl
 Funkhorchempfänger (Fuh "C" and "D")

Sets for mobile D/F:

Kapsch and Telefunken, for long range D/F Atcock.

Personnel.

The German intercepting and D/F organisation in Norway comprised about 120 experts and 20 girl interceptors at the end of 1944.

In the intercepting station in Oslo were:

5	receivers for intercepting the Western net (4 turns)
2	" " " " WNA-net "
1	" " " unknown traffic "

The station in Trondheim was smaller.

The mobile D/F disposed of approximately 20 D/F cars and D/F boats, each for 2-3 men.

The interception of illicit transmitters belonging to network still unknown to the German intercepting units

As long as the characteristics of a certain illicit network were unknown to the German interception, there was relatively little danger of the operators being intercepted.

For example one can mention a Milorg transmitter operating a wireless link between Oslo and the Norwegian Embassy in Stockholm. The operator was caught by chance by the Norwegian police in February this year. The transmitter worked in Oslo in the ground wave of the intercepting station since spring last year and was not once intercepted neither here nor on the Continent. At any rate no one knew that it was illicit traffic. The reason was that the transmitter used a different system of calling. Call signs linked with "de", a code with unknown meaning etc. were used.

After more details, as method of calling, q-code signals, method of the change of frequencies, construction of the coded messages, main frequencies of the home station and approximate frequency ranges are known, it is easier for the interceptors to identify almost all traffic of the same network.

The greatest difficulty is therefore to recognise the first illicit transmitter of an unknown network. For this purpose each intercepting unit had at its disposal particularly well trained interceptors knowing all characteristics of commercial, army and other wireless stations. Besides they had to be informed about all known illicit networks.

To each interceptor was allotted a separate small wave band which had to be searched day and night. As all intercepting units on the continent were allotted special bands different from the others, theoretically all important wave bands were continually under control.

First the interceptor would intercept the home stations of the unknown traffic. When the bearings pointed to the country which was supposed to send illicit messages, everything was done to find the corresponding outstation. At the same time all details about the traffic were sent to the HQ which checked up if it really was illicit traffic. If this was so, all characteristics were passed on to the other intercepting units in order to intercept eventual transmitters of the same network.

When home stations of a known network had communication with an outstation, the latter was generally intercepted about 1-2 weeks afterwards.

Procedure of Interception and Location of an illicit transmitter in NORWAY.

The German interception and D/F organisation in NORWAY had to cope with extremely great difficulties.

Owing to atmospheric (northern lights) and geographical conditions transmitters could better be intercepted on the continent than in NORWAY. Transmitters situated on the west coast were very difficult to intercept in OSLO, particularly when using directional aerials. An additional difficulty was the problem of the silent zones (skip distance). In OSLO f.ex. a transmitter operating in the area of ELVERUM could not be intercepted.

If a transmitter was intercepted in the intercepting station in OSLO the D/F stations of FORNEBU and JESSHEIM which had a direct telephone link to the HQ, were immediately warned.

To help the operators of the D/F in finding the right channel the signals of the illicit transmitter could be made audible to them. At the same time the D/F station in BERLIN and from there all other D/F stations were notified.

Afterwards the bearings were sent to the HQ in NORWAY, where the suspected area was plotted on maps. The mobile D/F were informed. The plotting office also decided which transmitters had priority according to their importance and the probability of locating them. The mobile D/F parties got continuously all informations about schedules, frequencies etc, thus enabling them to find the traffic immediately. In addition in the OSLO area a direct wireless communication was established between HQ and the D/F cars, so that all informations about frequencies etc. could be forwarded to them at once during the traffic.

Owing to great distances the communication system could not be as good in the other parts of NORWAY as it was in the OSLO area. In OSLO the D/F cars could easier operate than in the mountainous country where all unknown cars were regarded with curiosity and sometimes with suspicion. Besides the D/F cars in towns were able to approach the station much easier than in regions with bad roads.

When through crossbearings the transmitter was approximately located, D/F with special instruments mounted in suitcases, belts or rucksacks located the house or the place where the operator was working.

In 1944 about 12 illicit transmitters were seized by D/F.

How the Illicit Operator Could Escape
the German D/F

- 1) The intelligence of the country for which the illicit W/T operator is working, has to check up where the intercepting stations are situated in order to place the W/T station in the dead zone. All transmitters intercepted in the ground wave are under particular control.

If possible the intelligence has to find the telephone connections and intercept the conversations between the intercepting HQ and the D/F stations, thus getting valuable information about transmitters which are about to be located.

- 2) Interception is difficult when the home station sends messages pretending to be in communication with the outstation, thus deceiving the interceptors who are trying to find the illicit transmitter in vain. In a similar way the outstation deceives the interceptor when answering some time later.
- 3) If the homestation is operating on a frequency exactly 500 k/c higher or lower than the frequency of the outstation, the interference on the frequency of the outstation (when using German intercepting receivers) is such that it is almost impossible to get the signals. f.e. the home station operates on 9000 k/c
the out station " " 9500 ",
then the interceptor, when using his second receiver to intercept the out station, gets such a whistle in his earphone that he cannot take the signals.

This applies to intercepting units employing a single interceptor both for the home station and the out station.

- 4) The use of directional aerials makes intercepting and D/F difficult but can however not completely stop it. Also the use of reflectors hampers the D/F people.
- 5) W/T stations located near rivers, lakes, in mountainous regions are safer than in open country. If the local interference is not too great, the Transmitter should be located near transformers or electrical plants in order to deceive the D/F.

Operating in the open air is safest, when the operator moves each time to another place, if possible at a distance of more than 40 km.

- 6) Traffic during the night. The interceptors are not so diligent as during day time, also D/F is much more difficult, particularly in mountainous regions.

Never send too long messages.

A fine method of deceiving the D/F consists in sending half of the message from one station while the rest of it is sent by a second station situated in a different region. Particularly in large towns this method is good.

The use of illicit transmitters keyed mechanically deceives the interceptor who supposes they are commercial stations. If possible use call signs of commercial stations.

Work on high frequencies over 12,000, as the common D/F sets only reach the 12,000 limit.

An ideal illicit transmitter is a high speed transmitter with remote control, automatically destroyed by explosives in case the D/F enter the room, where it is operating.

When the enemy uses D/F aeroplanes, the W/T operator should not stop the traffic immediately, or the aircraft would know the suspected area. The method of deceiving the enemy consists in off-tuning a little. Thus the signals intercepted will fade and the aircraft thinks that it is out of the ground wave.

The W/T operator is exposed to more danger than others and should not have the code. For emergency cases he shall have an emergency code.

Operators in the OSLO area should never send longer than a fortnight from the same place, and never return to a place where he had already operated before.

Use as often as possible additional sending schedules, the traffic during the schedules being easier for interception by the enemy.

The transmitter plan, frequencies, callsigns, schedules etc, should change as often as possible.

When a transmitter is located in a large building with several floors it is possible to find out the floor in which the transmitter is operating by switching off the fuses of each floor successively.

Guards must be posted in such a manner that they can observe in all directions without being seen themselves. The enemy will come disguised appropriate to the respective region. Small closed lorries and people with suitcases, rucksacks etc, are particularly suspected.

Characteristics of the MILORG and British Systems.

The advantage of the MILORG system was that the transmitters operated either at 15,30 or 45 minutes after the full hour. Several transmitters were in action simultaneously. Therefore only the most important traffic could be intercepted by smaller intercepting units. The home station used the same callsign for a group of out-stations. It was therefore difficult for the interceptors to find the corresponding outstation.

In comparison with the British system the MILORG system had not enough callsigns for changing.

When using additional schedules MILORG transmitters would operate for whole hours, so it was easy to intercept them on the known frequencies.

The OTP code as used by British transmitters since autumn 1944 could not be decoded by the decyphering department of the German High Command in BERLIN.

The Russian Illicit Wireless System.

The Russian system was not so well organised as the western net but on the other hand it offered more difficulties to find out all details as there were many channels operating quite independently and using different procedures.

E.g. the Russian home stations using commercial procedures were for many years taken as commercial stations and therefore not intercepted, on the other hand commercial stations were supposed to be home stations of illicit transmitters, the interception of which proved useless.

Most of the home stations were located in the region of MOSKOW and LENINGRAD and had out stations in nearly all occupied territories.

As it was impossible for operators to stay during a longer period in GERMANY, the Russians organised wireless stations in SWITZERLAND which were in communication with their home stations in RUSSIA. The German D/F could therefore not get hold of them. Besides they worked only during the night.

Most of illicit operators in GERMANY were parachuted and operated from their bases quite independently without support of any organisation. They had mostly to put through reports about the morale, food conditions, military matters etc.

Their isolation often saved them from being given away, on the other hand the Gestapo could easily maintain the communication of captured operators with the home station for their own purposes. In NORWAY such a traffic was practically useless as the home station was rapidly warned by other members of the organisation.

There were only a few Russian transmitters in North NORWAY being under the command of the Chief of the Arctic Fleet. They had to report their observations about the German ship movements.

Besides Norwegian citizens also Germans (former members of the Communist Party) captured by the Russians in North FINLAND were trained as wireless operators in MURMANSK.

Each operator was instructed separately and prevented from getting in touch with his fellow-operators.

They had to learn by heart the transmitting plan with callsigns, schedules etc, and the codes. They mostly used so-called NABLA wireless sets.

They were either parachuted or sent by submarine to their bases, provided with sufficient food for 6-8 weeks. After this period they either had to march to a certain place on the coast from where they were transported back by submarines, or they got supply by air for another period.

The home station was in the region of MURMANSK.

South of TROMSØ Russian wireless transmitters have never been located by the German D/F.

Procedure of Russian W/T Stations.

Use of the normal q-code,

Example 1

3-letter callsign, not linked

qrk? qsy ok? k

ok qrk 5 k

qrv k

nr 1 ck 35 5-figure groups.

Frequency change: qsy, qsw with coded number or letter

pse shorter

pse longer

Example 2

qsa 0 pse call k
qsa 5 qrv

Use of z-code.

Call sign (sometimes linked with "de")
zhc ?
zok with following message
znn tks gb sk

The Russian operators keyed 5-figure, or sometimes 5-letter groups as abbreviated figure groups.

Main frequencies of the home station :6000,7000,9300,12.000,
13.000;
for the out-stations: 6300,6700,5800,5600;
further frequencies for out-stations between 7300 and 8800,
mainly in the last time before the capitulation.

Contrary to the sound of the British transmitters, the tone of the Russian transmitters is rough. It is therefore easy for a well trained interceptor to distinguish Russian from British transmissions.

Interception and D/F of Ultra-Short-Wave Transmitters.

At the beginning of 1944 Ultra short wave traffic was heard by the German intercepting troops on the West Coast of EUROPE.

As no illicit USW transmitter could be located on the Continent, it was supposed that training was going on in South ENGLAND and the Channel in view of the invasion. Indeed, since D-day a great number of USW operators who may have been dropped long before, began to work in Northern FRANCE.

A whole German intercepting Coy. was detached to the invasion-front. Stable intercepting units were distributed in the coastal districts on elevated places with good receiving conditions. They had to report any R/T traffic in foreign languages in the range of 30-300 m/c.

Mobile troops provided with D/F equipment tried to enter the ground wave range (max. distance from transm. 40 km. over sea 100 km) of such transmitters, and to locate them by a cross bearing from at least three points.

They worked in a similar way as the motorised D/F in the short wave range, but had to face still more difficulties owing to the fact that it was not possible to direct them by long range D/F to the approximate location of the illicit transmitter.

The chance of intercepting a USW communication was still lowered by the method of radiating the messages straight upward to flying central stations, thus restricting or eliminating the ground wave.

"Ascension"

On the other hand it was difficult to conceal the purpose of the mobile troops as the D/F equipment was mounted in trailers drawn by vehicles.

There was also body harness D/F used for the final locating of USW transmitters.

Considering the great number of USW transmitters working in and behind the front line for operational and sabotage purposes the number of located and captured operators was very small.

Ultra Short Wave Interception In NORWAY

In Summer 1944 a USW intercepting troop was sent to NORWAY by the CSO Branch of the German High Command in BERLIN in order to ascertain whether the Allies were using USW, and consequently an invasion was to be expected here as well.

The troop travelled along the coast from KRISTIANSAND to HAMMERFEST in a small escort ship. In this way any USW R/T sent from operators on the coast to submarines, ships and aircraft was likely to be intercepted.

Only the normal bomber and fighter traffic and some R/T, probably within British Naval formations, were intercepted. As to the communication between the Allies and Norwegian operators no result was obtained in the USW range. The lack of USW traffic was attributed to the fact that short wave transmitters were more reliable for the required communications, and also sufficiently protected in NORWAY owing to the difficulty for motorised D/F parties to move in sometimes inaccessible country.

On the other hand USW sets serving for special purposes were found; e.g. for directing aircraft parachuting supply for the MILORG in mountainous regions. Here the difficulties for D/F and interception were so evident that nothing was done to get hold of the ground stations by technical methods. The Luftwaffe was developing methods for the interception of the flying stations.

During the last weeks before the capitulation an attempt was made to intercept USW communications between NORWAY and SWEDEN. R/T transmitter-receivers of Swedish manufacturing had been seized and signal material found, but no practical result was obtained so far.

USW Equipment (For interception)

Intercepting Receiver "V"	(25 - 170 m/c)
" " "F"	(145 - 300 ")
" " LORENZ Würfel	(25 - 160 m/c).
Magnetophone "C".	

Signed. Dr. Novotny, Josef Hockauf, Dr. Grachev.